WELL CAP SYSTEMS

CROSS-REFERENCE TO RELATED APPLICATION

The present application claims priority from and is related to prior provisional application Serial Number 60/450,784, filed 02/28/03, entitled "WELL CAP SYSTEM", the contents of which are incorporated herein by this reference and are not admitted to be prior art with respect to the present invention by the mention in this cross-reference section.

BACKGROUND

This invention relates to well cap systems. More particularly, it relates to a system for capping at least one well pipe having at least one upper opening and at least one interior portion containing at least one controllable apparatus.

Often, building structures are supplied with water generated from a local groundwater well, most often where municipal or commercial water supplies are unavailable or prohibitive in cost to access. Typically, a water well consists of an essentially vertical hole or shaft, drilled into the earth to access a subterranean groundwater supply. This shaft (also known as a "well bore" or "borehole") may extend several hundred feet before reaching a water-bearing formation. Generally, at least the upper portion of the drilled hole is lined with a well casing consisting of a rigid pipe. The upper open end of the well casing is typically terminated above the ground and is used to access the interior of the well, for example, to place or service an in-well pump.

In current "constant pressure" water-well systems, a submersible pump located at the bottom of the well delivers pressurized water to a remotely-located structure through a water line extending between the well and the structure. Typically, a pump controller, located at the structure, monitors water pressure within the water-well system and regulates pump output to maintain desired water pressures under various conditions of water demand. Thus, the controller needs to be accessed/maintained at a different location than the pump or other equipment at the well site.

Usually, the pump controller and related apparatus are remotely located within a portion of a building some distance from the well. Power and control wiring must necessarily extend the distance between the controller within the building and the pump. Further, installation, monitoring, and service of completed well systems require that the building be at an appropriate point of construction and accessible to the well system installer. During installation, the well system installer must closely coordinate the well installation work with the operation and/or construction of a building or other closable structure access to which

typically requires permissions and/or appointments. Thus, continued monitoring and maintenance of the system requires further coordination with the building owner or operator to gain access to the remotely located controller equipment.

Therefore, a need exists for an improved well system which overcomes the prior problems and which permits installation, operation, and monitoring of a well system without the burdensome issues of coordination that currently exist.

OBJECTS OF THE INVENTION

A primary object and feature of the present invention is to overcome the above-mentioned problems and fulfill the above-mentioned needs.

It is a further object and feature of the present invention to provide a well cap system that reduces the need to utilize and access a remote structure during well installation, monitoring, and maintenance operations.

It is a further object and feature of the present invention to provide such a system that reduces the time and materials required to install a well system by locating a portion of the well controls at the well-site.

It is a further object and feature of the present invention to provide such a system that protectively encloses the top of the well casing and the local well control system.

It is a further object and feature of the present invention to provide such a system that provides a single well cap adaptable to a range of well casing sizes.

It is an additional primary object and feature of the present invention to provide such a system that is efficient, inexpensive and handy. Other objects and features of this invention will become apparent with reference to the following descriptions.

SUMMARY OF THE INVENTION

In accordance with a preferred embodiment hereof, this invention provides a system for capping at least one well pipe having at least one upper opening and at least one interior portion containing at least one controllable apparatus, the at least one controllable apparatus controlled by at least one local controller device, such system comprising: well capping means for capping the at least one well pipe; wherein such well capping means comprises, closure means for substantially closing the at least one upper opening, protective cover means for protectively covering the at least one local controller, and support means for supporting the at least one local control system within such protective cover means.

In accordance with another preferred embodiment hereof, this invention provides a system for capping at least one well pipe having at least one upper opening and at least one

interior portion containing at least one controllable apparatus, the at least one controllable apparatus controlled by at least one local controller device, such system comprising: at least one well cap to cap the at least one well pipe; wherein such at least one well cap comprises at least one closure adapted to substantially close the at least one upper opening, at least one protective cover adapted to protectively cover the at least one local controller device, and at least one support to support the at least one local controller device within such at least one protective cover. Moreover, it provides such a system wherein such at least one well cap is substantially supported by the at least one well pipe. Additionally, it provides such a system wherein such at least one closure comprises at least one mount adapted to mount such at least one closure to the at least one well pipe. Also, it provides such a system wherein: such at least one mount comprises at least one size-adapter to adapt such at least one closure to at least two such well pipes having different sizes; and such at least one size-adapter comprises at least one first one and at least one second one of such at least one mounts, such at least one first one being adapted to fit at least one such well pipe having a first size, and such at least one second one being adapted to fit at least one such well pipe having a second size different from such first size. In addition, it provides such a system wherein such at least one size-adapter adapts such at least one closure to such at least one well pipe having a nominal diameter of five-inches. And, it provides such a system wherein such at least one size-adapter adapts such at least one closure to such at least one well pipe having a nominal diameter of six-inches. Further, it provides such a system wherein such at least one size-adapter adapts such at least one closure to such at least one well pipe having an outer diameter of about seven inches. Even further, it provides such a system wherein such at least one size-adapter adapts such at least one closure to such at least one well pipe having a nominal diameter of eight-inches.

Moreover, it provides such a system wherein: such at least one closure further comprises an essentially planar member having at least one first face, at least one second face, and a peripheral edge; such at least one mount comprises at least one collar projecting outwardly from such at least one second face; and such at least one collar is adapted to engage at least one portion of the at least one well pipe. Additionally, it provides such a system wherein such at least one closure comprises a nested arrangement of at least two of such at least one collars. Also, it provides such a system wherein such at least one protective cover comprises: at least one peripheral wall; wherein such at least one peripheral wall defines at least one hollow cavity adapted to contain the at least one local controller device; and wherein such at least one peripheral wall comprises at least one access opening, having at least one

inner peripheral edge, to permit access to such at least one hollow cavity. In addition, it provides such a system wherein such at least one well cap further comprises at least one electrical passage structured and arranged to pass at least one electrical conductor from within such at least one hollow cavity to at least one point external to such at least one hollow cavity. And, it provides such a system wherein such at least one electrical passage comprises at least one threaded aperture. Further, it provides such a system wherein such at least one well cap further comprises: at least one vent to provide atmospheric venting between the at least one interior portion of the at least one well pipe, and at least one environment exterior to the at least one interior portion of the at least one well pipe; wherein such at least one vent comprises at least one channel to channel vented atmosphere from the at least one interior portion; and wherein such at least one channel comprises at least one isolator structured and arranged to isolate the vented atmosphere from the at least one local controller device.

Even further, it provides such a system further comprising: at least one first interlocker; and at least one second interlocker; wherein such at least one second interlocker is adapted to interlock with such at least one first interlocker; wherein such at least one first interlocker comprises such at least one closure; wherein such at least one second interlocker comprises such at least one protective cover; and wherein interlocking of such at least one first interlocker and such at least one second interlocker removably retains such at least one protective cover to such at least one base. Moreover, it provides such a system wherein: such at least one protective cover further comprises at least one first aperture adapted to pass at least one portion of at least one padlock shackle; such at least one closure further comprises at least one second aperture to pass the at least one portion of the at least one padlock shackle; and such removable retention of such at least one protective cover adjacent such at least one closure by such interlocking permits at least one position of alignment between such at least one first aperture and such at least one second aperture to permit passage of the at least one portion of the at least one padlock shackle through both such at least one first aperture and such at least one second aperture. Additionally, it provides such a system wherein such at least one peripheral wall comprises at least one data transfer port to permit at least one transfer of data between the at least one local controlling device within such at least one hollow cavity and at least one data transfer device external to such at least one well cap. Also, it provides such a system wherein: such at least one data transfer port comprises of such at least one peripheral wall; such at least one transparent portion is structured and arranged to provide at least one signal view of at least one portion of the at least one local controller device even when such at least one protective

cover is removably retained on such at least one base. In addition, it provides such a system wherein: such at least one first interlocker comprises at least one peripheral notch formed within such at least one peripheral edge of such at least one closure; such at least one second interlocker comprises at least one tab projecting from such at least one inner peripheral edge of such at least one protective cover; such at least one peripheral notch is adapted to permit such at least one tab to pass through such at least one closure from a position adjacent such at least one first face, to a position adjacent such at least one second face; and at least one rotation of such at least one protective cover relative to such at least one closure, while such at least one tab is in the position adjacent such at least one second face, removably retains such at least one protective cover on such at least one base member. And, it provides such a system wherein such at least one well cap substantially comprises at least one thermoplastic. Further, it provides such a system wherein such at least one well cap is substantially comprised of aluminum. Even further, it provides such a system wherein such at least one well cap is substantially comprised of stainless steel. Even further, it provides such a system wherein such at least one well cap is substantially comprised of brass.

In accordance with another preferred embodiment hereof, this invention provides a system for supplying a flow of water, from at least one well having at least one well pipe, at least one upper well pipe opening and at least one pipe interior, to at least one structure having a pressurized water supply, comprising, in combination: at least one pump to pump water from the at least one pipe interior; at least one local control system to control such at least one pump; at least one well cap, comprising at least one internal hollow, to cap the at least one upper well pipe opening; wherein such at least one local control system is located essentially within such at least one internal hollow of such at least one well cap. Even further, it provides such a system wherein such at least one local control system comprises at least one local pressure sensor for monitoring the pressure of the flow of water delivered from such at least one pump.

Even further, it provides such a system further comprising such at least one well having at least one well pipe. Even further, it provides such a system wherein such at least one local pressure sensor is located within such at least one well pipe of such at least one well. Even further, it provides such a system further comprising at least one water transfer system to transfer the flow of water from such at least one well to the at least one structure having at least one pressurized water supply. Even further, it provides such a system further comprising such at least one structure having at least one pressurized water supply. Even further, it provides such a system wherein such at least one well and such at least one local control system are

structured and arranged to permit maintenance of such system without entry to the at least one structure. Even further, it provides such a system wherein such at least one local control system comprises the sole controller of such at least one pump within such system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a well cap system installed on the above grade portion of a well casing, according to a preferred embodiment of the present invention.

FIG. 2 is a sectional view through the section 2-2 of FIG. 1 illustrating internal features of the well cap system.

FIG. 3A is an exploded view of the well cap system, according to the preferred embodiment of FIG. 1 and FIG. 2.

FIG. 3B is a sectional view through a vent assembly of the well cap system, according to the preferred embodiment of FIG. 1 through FIG. 3.

FIG. 4 is a top view of a base member of the well cap system, according to the preferred embodiment of FIG. 3A.

FIG. 5 is a bottom view of a protective cover of the well cap system, according to the preferred embodiment of FIG. 3A.

FIG. 6 is a sectional view through the section 6-6 of FIG. 4.

FIG. 7 is a top view of the base member, according to the preferred embodiment of FIG. 3A.

FIG. 8 is a sectional view through the section 8-8 of FIG. 4.

FIG. 9 is a diagrammatic sectional view through a well system supplying water to a structure such as building **202**, according to a preferred embodiment of the present invention.

FIG. 10 is detail view 10 of FIG. 9 depicting, in partial section, a pressure detector used in conjunction with a local pump controller.

DETAILED DESCRIPTION OF
A PREFERRED EMBODIMENT OF THE INVENTION

FIG. 1 is a perspective view of well cap system **100** installed on the above grade portion **102** of well casing **104** (shown in dashed lines), according to a preferred embodiment of the present invention. Preferably, well cap system **100** is substantially supported by well casing **104**, as shown. Preferably, well cap system **100** (at least herein embodying well capping means for capping the at least one well pipe; and further at least herein embodying at least one well cap to cap the at least one well pipe) comprises two principal components: a closure member **106**, and a removable protective cover **108**, supported by closure member **106**,

as shown.

FIG. 2 is the sectional view 2-2 of FIG. 1 illustrating internal features of well cap system **100**. FIG. 2 diagrammatically illustrates a typical application of well cap system **100** installed on a well having a controllable apparatus **118** (shown in dashed lines), preferably and typically a pump, and an associated controller **120** (also shown in dashed lines). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as well type, intended use, local regulatory requirements, etc., other controllable apparatus arrangements may suffice; for example, controllable apparatus **118** may also comprise a valve, motor, monitor, etc.

Preferably, closure member **106** (at least herein embodying closure means for substantially closing the at least one upper opening) comprises an essentially planar disk having an upper face **110** (at least herein embodying at least one first face), a lower face **112** (at least herein embodying at least one second face), and perimeter edge **113** (at least herein embodying a peripheral edge), as shown. Lower face **112** preferably includes a downwardly-projecting mounting collar **114** (at least herein embodying wherein such at least one closure comprises at least one mount adapted to mount such at least one closure to the at least one well pipe; and further comprising at least one collar projecting outwardly from such at least one second face) adapted to fit over the upper opening **116** of well casing **104**, as shown. Most preferably, closure member **106** comprises several nested mounting collars **114** to permit a single well cap system **100** to adapt to various diameter well casings **104** (shown in dashed lines). Preferably, one or more removable mechanical fasteners, such as screw **119,** are used to retain well cap system **100** on well casing **104**, as shown. Screw **119** preferably threads through mounting collar **114** and engages well casing **104**, as shown. Preferably, mounting collar **114** is pre-drilled to permit screw **119** to pass, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as cost, ease of installation, required security at the well site etc., other fastening arrangements may suffice, such as, for example, friction-fitting, bolting, clamping, etc.

Upper face **110** (at least herein embodying support means for supporting the at least one local control system within such protective cover means; and further at least herein embodying at least one support to support the at least one local controller device within such at least one protective cover) of closure member **106** preferably serves as a support and mounting surface for controller **120**, as shown. The preferred thickness of closure member **106** between upper

face **110** and lower face **112** is about one-half inch, providing closure member **106** with suitable structural rigidity to permit support of controllers **120** of various weights and mounting requirements. In the present example of FIG. 2, closure member **106** has been drilled through upper face **106** and tapped to provide threaded sockets **122** for securely mounting controller **120** to closure member **106**, as shown. Closure member **106** further preferably comprises one or more threaded openings **126** to permit electrical power and control circuits to pass through closure member **106**, as shown. In the example of FIG. 2, threaded opening **126** (at least herein embodying wherein such at least one well cap further comprises at least one electrical passage structured and arranged to pass at least one electrical conductor from within such at least one hollow cavity to at least one point external to such at least one hollow cavity) is fitted with threaded fitting **128** adapted to provide a termination point for supply conduit **124**. Also visible in the sectional view of FIG. 2 is a second preferred threaded opening **126** and threaded fitting **128** that permits control wiring **130** to route from controller **120** through closure member **106** to controllable apparatus **118** and/or secondary apparatus **132**, as shown.

Preferably, controller **120** is protectively housed within cavity **134** formed by the cap-like protective cover **108** (at least herein embodying protective covering means for protectively covering the at least one local controller; and further at least herein embodying at least one protective cover adapted to protectively cover the at least one local controller device), as shown. Preferably, protective cover **108** comprises a unitary, hollow, member, as shown. Preferably, protective cover **108** comprises a generally cylindrical-shaped enclosure having a continuous sidewall **136,** projecting from a generally circular integral top **138**, as shown. Preferably, lower perimeter edge **140** of sidewall **136** defines opening **139** (at least herein embodying at least one peripheral wall defining at least one hollow cavity adapted to contain the at least one local controller device; and further at least herein embodying wherein such at least one peripheral wall comprises at least one access opening, having at least one inner peripheral edge, to permit access to such at least one hollow cavity) preferably sized to mount over the outer perimeter edge **113** of closure member **106,** as shown. The lower interior face of sidewall **136** preferably comprises an integral annular offset **142** adapted to rest on upper face **110** of closure member **106**, as shown.

Lower perimeter edge **140** of sidewall **136** preferably extends below the level of lower face **112,** as shown, to permit effective shedding of rainwater.

Preferably, well cap system **100** comprises view-port **144,** preferably consisting of view

aperture **150** through circular top **138**, as shown. Preferably, view-port **144** is fitted with transparent cover **146**, as shown. In use, view-port **144** permits a view from the exterior of well cap system **100** to a portion of controller **120** without removing protective cover **108**. The preferred use of view-port **144** permits a reading of the status of controller **120** by means of a display panel or infrared data transfer means. It is preferred that transparent cover **146** is constructed of a rigid plastic, such as polycarbonate. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as cost and application, etc., other transparent and/or translucent materials may suffice, such as, for example, glass, styrene, etc.

Well cap system **100** preferably includes a security padlock accommodation **148** for securing protective cover **108** to closure member **106,** thus preventing unauthorized access to controller **120**, as shown. Preferably, security padlock accommodation **148** comprises first lock aperture **150** within protective cover **108,** and second lock aperture **152** within closure member **106,** as shown. Preferably, both first lock aperture **150** and second lock aperture **152** are adapted to pass the shackle **156** of padlock **154**, as shown. The preferred arrangement of second lock aperture **152** of security padlock accommodation **148** is more clearly visible in FIG 3 as described below.

Preferably, protective cover **108** and closure member **106** allow for at least one position of alignment between first lock aperture **150** and second lock aperture **152** to permit a simultaneous passage of padlock shackle **156**, as shown.

FIG. 3A is an exploded view of the well cap system **100,** according to the preferred embodiment of FIG. 1 and FIG. 2. The preferred arrangement of second lock aperture **152** of security padlock accommodation **148** (as illustrated in FIG. 2) is clearly visible in FIG 3A. Preferably, second lock aperture **152** is located within tongue member **156,** projecting downwardly from perimeter edge **113**, as shown. The corresponding first lock aperture **150** is visibly located at lower perimeter edge **140** of protective cover **108**. In the preferred embodiment of FIG. 1 through FIG. 3A, closure member **106** contains three threaded openings **126**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as specific applications, apparatus requirements, etc., other quantities and arrangements of apertures, such as, for example, the inclusion of unassigned apertures, spare apertures, etc., may suffice. Preferably, unused threaded openings **126** are filled with blanking inserts **158,** as shown. Under appropriate circumstances, such as to expedite conduit installation, threaded

openings **126** may be supplied with one or more threaded fittings **128** pre-installed by the supplier or manufacturer.

Preferably, well cap system **100** is adapted to permit controlled atmospheric venting between the interior of the well casing and the outside environment. To accommodate atmospheric venting of well casing **104**, closure member **106** preferably comprises vent assembly **160** comprising a first vent aperture **162**, second vent aperture **164** and venting channel **166**, as shown. Preferably, first venting aperture **162** penetrates closure member **106** at a location permitting first venting aperture **162** to be in fluid communication with the interior portion **168** of well casing **104** (while closure member **106** is installed). Preferably, second vent aperture **164** also penetrates closure member **106**, but is located such that one end is in fluid communication with the environment exterior to the interior portion **168** of well casing **104**. Preferably, venting channel **166** acts as an air passage (see FIG. 3B), bridging between first venting aperture **162** and second vent aperture **164**, as shown. Preferably, venting channel **166** is fastened to closure member **106** using threaded fasteners **169**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as fabrication cost material choice, etc., other venting arrangements may suffice, such as, for example, venting channel **166** may be integral to closure member **106**.

Furthermore, upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as controller function and availability, other controller sizes, shapes and mounting means may suffice. Moreover, under appropriate circumstances, controllable apparatus **118** may preferably include such proprietary components as mounting standoffs **170**, mounting anchors, etc.

FIG. 3B is a sectional view through vent assembly **160** (at least herein embodying at least one vent to provide atmospheric venting between the at least one interior portion of the at least one well pipe, and an environment exterior to the at least one interior portion of the at least one well pipe), according to the preferred embodiment of FIG. 1 through FIG. 3A. Referring specifically to FIG. 3B with continued reference to FIG. 3A, preferably venting channel **166** (at least herein embodying at least one channel to channel vented atmosphere from the at least one interior portion) comprises a hollow, substantially rectangular U-shaped member, as shown. Preferably, air moving between first vent aperture **162** and second vent aperture **164** passes through hollow cavity **172** of venting channel **166** that is preferably

positioned over the vent apertures, as shown. Venting channel **166** preferably isolates moist air within well casing **104** from and essentially keeps that moist air from directly reaching controller **120** (at least herein embodying at least one isolator structured and arranged to isolate the vented atmosphere from the at least one local controller device). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as intended environment, service duration, etc., other venting arrangements may suffice, such as, for example, hollow cavity **172** may include such preferred features as screening or packing to prevent entry of insects or other unwanted materials into well casing **104**.

In reference to FIG. 4 and FIG. 5, FIG. 4 is a bottom view of closure member **106,** according to the preferred embodiment of FIG. 3A. FIG. 5 is a bottom view of protective cover **108,** according to the preferred embodiment of FIG. 3A. Preferably, well cap system **100** comprises an arrangement that permits protective cover **108** to be removably retained on closure member **106** by means of asymmetrically arranged interlocking tabs **176** located along the interior edge **177** of opening **139,** and complementary peripheral notches **178** (at least herein embodying at least one first interlocker) positioned along perimeter edge **113**, as shown. Preferably, peripheral notches **178** are adapted to permit interlocking tabs **176** (at least herein embodying at least one second interlocker wherein such at least one second interlocker is adapted to interlock with such at least one first interlocker) to pass through closure member **106** from a position above upper face **110**, to a rotatable position below lower face **112,** as shown. Rotation of protective cover **108** relative to closure member **106**, while interlocking tabs **176** are below lower face **112**, preferably misaligns peripheral notches **178** and interlocking tabs **176** and thereby removably retains protective cover **108** on closure member **106**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as ease of manufacturing, required security, etc., other methods of retaining protective cover **108** on closure member **106** may suffice, such as, for example, screws, bolts, hinges, clasps, removable attachments, etc. A shallow recess **180** is preferably formed into lower face **112**, adjacent to second lock aperture **152**, to permit the shackle of a padlock to clear closure member **106** (as illustrated in FIG. 2).

As noted in the prior figures, closure member **106** preferably comprises adapter assembly **174** (at least herein embodying at least one size-adapter to adapt such at least one closure to at least two such well pipes having different sizes) to permit a single well cap system

100 to be adapted to several well casing **104** sizes (in the present application, the term "size" most preferably refers to a measured diameter of a well casing having a circular section). In a preferred arrangement, adapter assembly **174** comprises three mounting collars **114,** permitting closure member **106** to be mounted to four different well casing sizes, as further described in FIG. 6 (at least herein embodying wherein such at least one size-adapter comprises at least one first one and at least one second one of such at least one mounts, such at least one first one being adapted to fit at least one such well pipe having a first size, and such at least one second one being adapted to fit at least one such well pipe having a second size different from such first size).

FIG. 6 is the sectional view 6-6 of FIG. 4 illustrating, in greater detail, the preferred arrangement of adapter assembly **174**. Adapter assembly **174** preferably comprises outer collar **182**, intermediate collar **184,** and inner collar **186**, as shown. Preferably, outer collar **182,** intermediate collar **184,** and inner collar **186** each comprise a generally cylindrical-shaped member having an inner diameter and an outer diameter, as shown. Preferably, the mounting collars **114** of adapter assembly **174** are concentrically nested, as shown.

Preferably, inner collar **186** has an interior diameter **A** of about 5.60 inches to permit inner collar **186** to fit over well casing **104,** having a nominal diameter of about 5 inches (about 5.56 inches O.D.). Those with ordinary skill in the art, upon reading the teachings of this specification, will appreciate that the term "nominal" preferably refers to a pipe diameter or wall thickness, as specified, which may vary from the actual physical size. Preferably, inner collar **186** has an outer diameter **B** of about 5.96 inches to permit inner collar **186** to fit within interior portion **168** of well casing **104,** having a nominal diameter of about 6 inches (about 6.065 inches I.D.). Preferably, intermediate collar **184** has an inner diameter **C** of about 7.02 inches to permit intermediate collar **184** to fit over well casing **104,** having an outside diameter of about 7 inches. Intermediate collar **184** has a preferred outer diameter **D** of about 7.98 inches. Preferably, outer collar **182** has an inner diameter **E** of about 8.64 inches to permit outer collar **182** to fit over well casing **104** having a nominal diameter of about 8 inches (about 8.625 inches O.D.). Preferably, each mounting collar projects from lower face **112** about 2 inches, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as well configuration, well casing size, etc., other mounting collar arrangements may suffice, such as, for example, use of collar sizes adapted to other well casing diameters both larger and smaller, adaptations to fit non-circular casings, use of adjustable banding clamps, etc.

Preferably, mounting holes **196** are pre-drilled through each of the mounting collars **114**, in concentrically aligned sets, each set positioned along a common axis, as shown. Preferably, the open areas between mounting collars **114** adjacent to lower face **112** may include an annular seal **230**, as shown. Preferably, annular seal **230** comprises an adhesive-backed foam or rubber material having a thickness of about 1/8th inch. Preferably, annular seal **230** permits lower face **112** to positively seal against the upper end of well casing **104**, as shown.

In reference to FIG. 7, with continued reference to the prior Figures, FIG. 7 is a top view of closure member **106,** according to the preferred embodiment of FIG. 3A, illustrating a preferred arrangement of system components. Base member **106** has an outer diameter **F** of about one foot.

Preferably, well cap system **100** is constructed from one or more substantially rigid and durable materials. To reduce the risk of electrical shock, system **100** is preferably produced from a non-metallic material. Currently, it is most preferred that both closure member **106** and protective cover **108** be constructed from the same material, preferably a UV-stabilized thermoplastic, such as ABS (acrylonitrile butadiene styrene). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as cost, harsh local well environments, etc., the use of other materials in the construction of the well cap system may suffice, such as, for example, PVC plastic, fiber-reinforced resins, stainless steel, aluminum, brass, etc.

FIG. 8 is the sectional view 8-8 of FIG. 4 through protective cover **108**. Preferably, protective cover **108** comprises a unitary moisture-resistant thermoplastic housing. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as the strength characteristics of the selected fabrication materials, utilization of specialized housing configurations, etc., other wall thickness or dimensional arrangements from those illustrated below, may suffice, such as, for example, the incorporation of thinner or thicker material sections or use of selective areas of reinforcement. It is preferred that protective cover **108** comprises an average wall thickness of about 0.41 inch (using the preferred ABS thermoplastic material). Although it is preferred that only the closure member **106** comprise such features as threaded openings **126**, controller **120** mountings and support, those of ordinary skill in the art, upon reading the teachings of this specification, will now appreciate that, under appropriate circumstances, protective cover **108** may include any or all of the above-mentioned features and components. Further, protective cover **108** may, under appropriate circumstances,

comprise the outer housing of controller **120**.

FIG. 9 is a diagrammatic sectional view through operating well system **200,** supplying water to a structure shown as building **202,** according to a preferred embodiment of the present invention. Well system **200** is preferably of a constant pressure type whereby water pressure is maintained within the system, regardless of the water demand, as shown. Preferably, well system **200** comprises; submersible pump **204**, local pump controller **206**, pressure detector assembly **208**, power/control connection **205** and well cap system **100**, as shown. Well system **200** may further comprise; water-well **210**, water transfer piping **212** (to transfer water from submersible pump **204** to building **202** or other structure), pitless adapter **209**, electrical supply **214**, pressure tank **215** and, under appropriate circumstances, building **202** (or other structure having a pressurized water supply), as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as local codes and specific site requirements, the use of additional components within the well system may suffice, such as, for example, check-valves, test fittings, electrical and grounding connectors, splice boxes, electrical breakers, torque arresters/stop, etc.

Prior water-well installations typically locate the pump controller within building **202** (for example, within a utility room of a private residence). Monitoring and maintenance of prior systems has therefore required some level of access to such structure. Further, the use of prior constant pressure systems in new building construction has required that an appropriate level of construction be completed before the pump controller and related equipment can be installed.

Well system **200** overcomes the deficiencies of prior well systems by utilizing well cap system **100** to permit local control, monitoring and maintenance of the well system at well site **216**, as shown. This arrangement reduces or eliminates issues, for closable structures restricting entry, of building access and availability (at least herein embodying wherein such at least one well and such at least one local control system are structured and arranged to permit maintenance of such system without entry to the at least one structure). Additionally, the requirement to route power/control connection **205** the extended distance from submersible pump **204** to a controller located in building **202** has been eliminated, as both local pump controller **206** and power supply **214** may be local to well site **216**, as shown. It is noted that, the term "structure" shall include within its definition, a broad range of constructions and apparatus, such as, for example, occupiable buildings, remote livestock tanks, irrigation

systems, drinking fountains, storage tank compounds, etc.; and the term "building" shall include within its definition only "structures" having restricted access and/or typically requiring permissions and/or appointments for access.

In preferred operation, a single local pump controller **206** (preferably supported within well cap system **100**) receives electricity from power supply **214** and pressure data from pressure detector assembly **208**, as shown. Local pump controller **206** is preferably preprogrammed to maintain a selected water pressure within the system. Local pump controller **206**, by detecting a water pressure drop at pitless adapter **209**, maintains the preset system pressure by regulating the output of submersible pump **204**. Preferably, the pressurized water output from submersible pump **204** is directed through water transfer piping **212** to building **202**, as shown. In most circumstances, the only required connection to building **202** is water transfer piping **212**, as shown (at least herein embodying at least one water transfer system to transfer the flow of water from such at least one well to the at least one structure having at least one pressurized water supply).

Preferably, local pump controller **206** is a commercially- available variable frequency drive compatible unit (for example, control box model CU301 produced by Grundfos Pumps Corporation of Fresno California, U.S.A.). Preferably, local pump controller **206** comprises a selector and display panel **218** for system monitoring and adjustment. Preferably, selector and display panel **218** is conveniently viewable through view-port **144** (at least herein embodying wherein such at least one peripheral wall comprises at least one data transfer port to permit at least one transfer of data between the at least one local control system located within such at least one hollow cavity and at least one data device external to such at least one well cap; and at least herein embodying wherein such at least one transparent portion is structured and arranged to provide at least one signal view of at least one portion of the at least one local controller device even when such at least one protective cover is removably retained on such at least one base) from outside well cap system **100**, as shown. Under appropriate circumstances, local pump controller **206** may include a hand-held infrared remote **220** (such as unit model R100 produced by Grundfos Pumps Corporation of Fresno California, U.S.A.), capable of retrieving pump and performance data by data exchange through view-port **144**, as shown.

Preferably, submersible pump **204** is a high-efficiency variable frequency drive unit, preferably comprising a permanent-magnet motor with an output matched to the specific well application. Preferably, submersible pump **204** used in well system **200** is commercially available, and may be sourced from, for example, the SQE line of variable-frequency drive

pumps produced by Grundfos Pumps Corporation (as noted above). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering issues such as cost and availability, other manufacturers of pumps and controllers may suffice, such as, for example, Franklin Electric Company, Inc., Bluffton, IN, U.S.A., or Goulds Pumps, ITT Industries, Seneca Falls, NY.

It is currently preferred that at least one pressure tank **215** or similar device be utilized within the system, as shown. Pressure tank **215** preferably serves to help regulate and maintain the system water pressure and reduces pressure fluctuations that occur during on-and-off cycling of submersible pump **204**.

FIG. 10 is a detail view of detail 10 of FIG. 9 depicting, in partial section, pressure detector assembly **208** adapted to engage pitless adapter **209** (at least herein embodying wherein such at least one local pressure sensor is located within such at least one well pipe). Preferably, pressure detector assembly **208** (at least herein embodying at least one local pressure sensor for monitoring the pressure of the flow of water delivered from such at least one pump) is a solid state transducer having a threaded end that is adapted to engage a portion of water transfer piping **212**, most preferably the top of pitless adapter **209,** as shown.

Although applicant has described applicant's preferred embodiments of this invention, it will be understood that the broadest scope of this invention includes such modifications as diverse shapes and sizes and materials. Such scope is limited only by the below claims as read in connection with the above specification. Further, many other advantages of applicant's invention will be apparent to those skilled in the art from the above descriptions and the below claims.